

BROAD STREET STREETScape
TOWN OF MANCHESTER, CONNECTICUT

CONCEPTUAL DESIGN REPORT



MARCH 2005

PREPARED BY:

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DESIGN STATEMENT

EXECUTIVE SUMMARY

In 2003 the Manchester Board of Directors funded the Parkade/Broad Street Revitalization Study. The study was overseen by a steering committee made up of members of the Planning and Zoning Commission, Economic Development Commission, and Redevelopment Agency and supported by staff from the planning and engineering departments. Part for this Study involved developing a Master Plan that established goals for streetscape enhancements along Broad Street. These streetscape enhancements were proposed to improve the physical appearance of Broad Street, visually unify the corridor, and to provide impetus for future private investment and redevelopment.

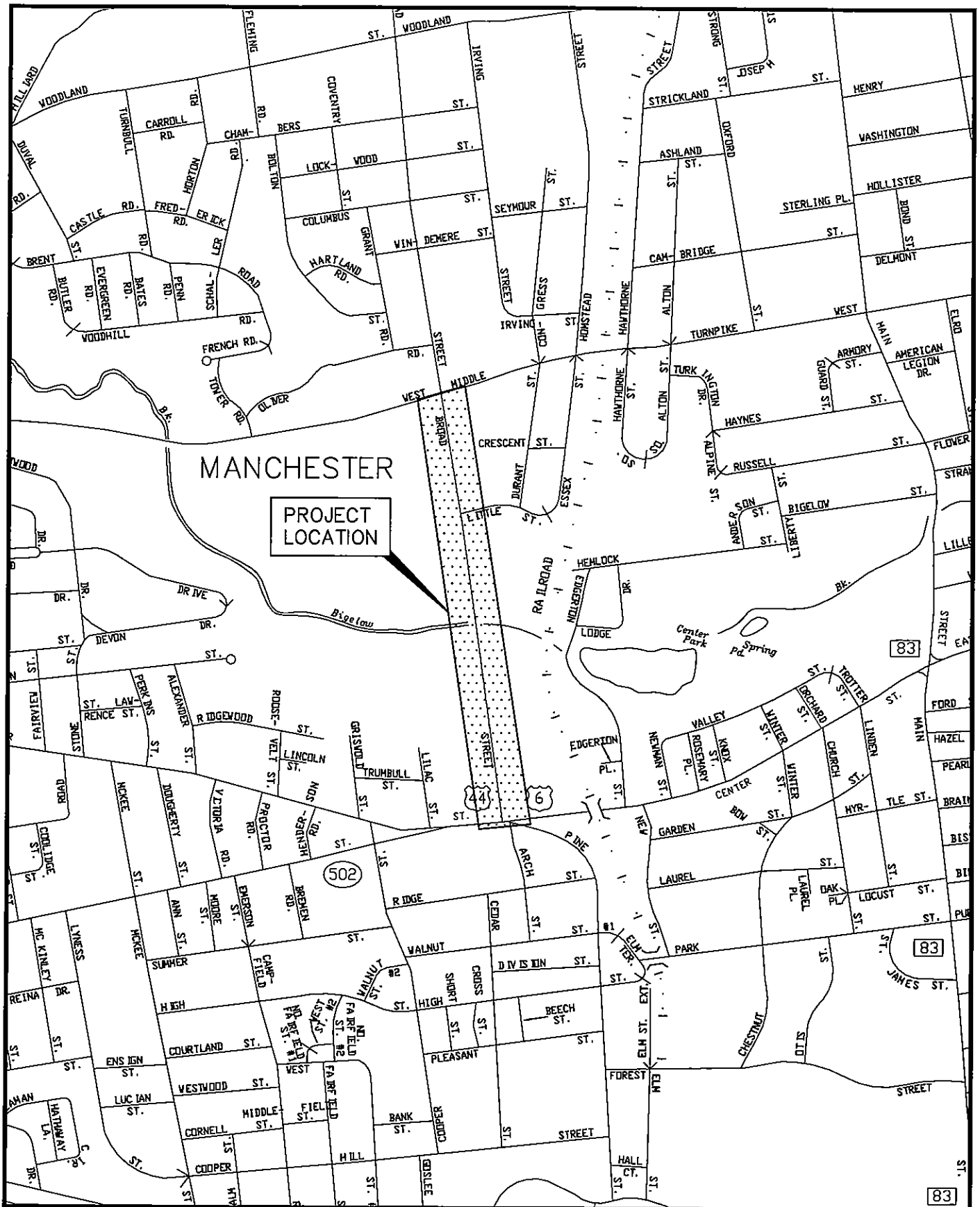
In the summer of 2004 the Town of Manchester funded the current phase of this project that involves developing a detailed Concept Plan for Broad Street that utilizes the goals defined in the Broad Street streetscape Master Plan. The Concept Plan phase will provide the Town of Manchester valuable information in moving forward with this project by providing a conceptual design that meets the Master Plan goals, and by defining critical design and construction issues, property impacts, environmental and permitting issues, and construction costs associated with the streetscape improvements.

Refer to Fig. L1 for the project limits and location.

PROJECT AREA / EXISTING CONDITIONS

The project area involves approximately 3,200 lf of Broad Street. Broad Street is a heavily traveled connector street bounded on its south end by Center Street (State Route 6/44) and on its north end by Middle Turnpike West. Broad Street is located near the geographical center of Manchester and at the westerly edge of Manchester's Center neighborhood. Manchester's Center neighborhood is an urbanized core of Town that includes the City's downtown and municipal center. Broad Street itself has pavement widths that vary between 40' and 70'. The widest pavement widths occur near the Center Street intersection where Broad Street maintains three travel lanes heading east towards the signalized intersection at Center Street. Other signalized intersections occur at Broad Street's intersections with Green Manor Boulevard and Middle Turnpike West. Development along Broad Street primarily involves commercial and service type retail development. Several newer developments such as Autozone, Rite Aid, Wendy's Restaurant, and a Shaw's shopping center occur along Broad Street, but the vacant Parkade Plaza dominates a large portion of the roadway.

Broad Street itself suffers from a lack of character that is largely caused by a lack of consistency in the existing streetscape, and underutilized and vacant business parcels. Items such as varying curb types, an incomplete sidewalk network, varying shelf treatments, a lack of uniform building setbacks, excessive curb cuts, and poorly maintained landscaping along some business parcels contribute to this. In general there is a lack of vegetation along the roadway.



BROAD STREET
LOCATION MAP
MANCHESTER, CONNECTICUT

Designed	---	<div style="font-size: 2em; font-weight: bold; display: inline-block; vertical-align: middle;">L1</div>
Drawn	---	
Checked	---	
Approved	---	
Scale	AS NOTED	
Project No.	04C0898	
Date	2/15/05	
CAD File	Location Map for Broad Street	

For existing conditions photographs refer to Appendix A.

PROJECT GOALS AND RECOMENDATIONS

The primary goal of the project is to create a consistent and attractive roadway system that will provide balance for all its users, and that will promote continued economic redevelopment. Recommendations necessary to achieve these goals were first made in the Streetscape Master Plan portion of the 2003 the Parkade/Broad Street Revitalization Study. These recommendations included:

- Intersection improvements at Broad Street with Center Street and Middle Turnpike.
- Improved access management on Broad Street by better defining driveways and curb cuts and reducing the number and size of curb cuts in identified problem locations along Broad Street.
- Create a uniform roadway pavement width and install uniform curbing materials along the entire length of Broad Street.
- Street trees of suitable size and type, strategically placed to create human scale without blocking businesses and to detract from overhead utilities.
- Install continuous sidewalks on both sides of the street
- Install concrete entrance aprons
- Colored, textured crosswalks at four locations, possibly with “bump outs” extending slightly into the road to slow traffic and reduce the amount of road width for pedestrians to cross.
- Where possible, “gateway” landscaping at major intersections to soften visual landscape and create an attractive invitation for business patronage.

In the summer of 2004 BL Companies was hired to conduct preliminary engineering and urban planning studies to develop a conceptual design for Broad Street that achieves the goals established in the Master Plan recommendations. This phase of the project involved meeting with town planning and engineering staff, conducting a walking tour of the project area with the Steering Committee, evaluating and documenting the existing physical and right-of-way conditions, establishing critical design controls for this project, and then implementing a design that met project goals. Four main design components were used to implement a design that met the project goals. They are as follows:

- The typical Broad Street pavement width should be narrowed from 44 feet to 38 feet, gaining additional space within the right-of-way for sidewalk, snow shelf, driveway access, and landscaping improvements without requiring property taking or negatively impacting business parking. Broad Street would remain a three-lane roadway section with two 12-foot wide travel lanes and one 14-foot wide shared left-turn lane.

- Apply a typical roadway section that uses granite curbing, 4' minimum grass snow shelf, 5' concrete sidewalks along both sides of the road, and uses typical concrete driveway aprons at all driveways.
- Median islands should be established at strategic locations along Broad Street where they will not limit access to businesses. These will serve to add visual interest to the street, to increase the sense of pedestrian scale, and to screen overhead utilities.
- Create three "gateway" areas within the project limits. These will occur at the intersections of Broad Street and Middle Turnpike, Broad and Center Street, and Broad Street and Green Manor Boulevard. Gateway areas will utilize items such as special pavers for the sidewalks and simulated brick treatments for the crosswalks.

In addition to the streetscape improvements, roadway and infrastructure improvements are also recommended along Broad Street. These recommendations include:

- Structural pavement section improvements to address pavement and subbase failures. It should be noted that a geotechnical investigation of the Broad Street pavement structure or underlying soils was not completed as part of this study. Structural pavement improvements were made under the assumption that the full-depth reclamation of Broad Street is a viable option for making long-term improvements to the pavement structure. This assumption should be substantiated prior to going to referendum and allotting money for this project.
- Roadway drainage improvements to address roadside ponding that occurs at several points along the roadway. The existing drainage systems within the project limits are sporadic and inadequately spaced. Drainage improvements will include adding new drainage structures where required, and will also likely involve slight modifications to the roadway and gutter line profile grades.
- BL Companies recommends the replacement of the existing culvert in its entirety to correct the structural and functional deficiencies, and to improve the overall hydraulic performance of the culvert. See Appendix C for full report.

APPLICABLE DESIGN STANDARDS

The design standards for this project are in accordance with an urban collector classification for Broad Street, and in conformance with the Connecticut Department of Transportation's "Highway Design Manual", 2003 Edition, and the Town of Manchester's Public Improvement Standards, dated January 19th, 2004.

UTILITIES

Utility investigations related to the Conceptual Design Phase of this project primarily involved working with CL&P, SBC, and Cox Communications to develop "Order of Magnitude" costs for undergrounding the extensive Broad Street overhead utility lines. Traveling north on Broad Street

from Center Street to Middle Turnpike West overhead utility lines are primarily located along the western side of Broad Street for the first 1,200 lf. Past this location overhead utility lines are located along both sides of Broad Street road for the remaining 2,000 lf of the road. These lines currently dominate overhead views along Broad Street, and contribute greatly to the poor aesthetics of this roadway.

CL&P, SBC, and Cox Communications all performed field investigations of their overhead facilities, and provided "Order of Magnitude" costs for under grounding their lines. Costs for each of these three utility companies is as follows:

CL&P

Based on their field investigation, CL&P provided unit costs for under grounding their facilities along Broad Street. These unit costs included applying a unit cost of \$1,000/lf for under grounding their main overhead facilities located along the western side of Broad Street, and a unit cost of \$500/lf for under grounding their overhead service lines located along the eastern side of Broad Street. Applied to the 3,200 lf of Broad Street this results in a \$4,200,000 cost for under grounding these lines.

SBC

SBC did an engineered evaluation of under grounding their entire Broad Street facilities at cost to the Town of Manchester. Their initial cost for doing this work was estimated at \$2,000,000.

Cox Communications

Based on their field investigation, Cox Communications estimated a cost of \$180,000 for under grounding their overhead lines excluding the cost of conduit and structure installations. With all costs included under grounding their facilities was estimated at \$500,000.

Total Cost

Added together the total probable cost for under grounding all of the overhead utility lines along Broad Street was estimated at \$6,700,000. This cost includes the utility companies or their contractor performing trenching, conduit, and structure installations. The Town of Manchester could lessen the \$6,700,000 cost to some extent by contracting for trenching, conduit, and utility structure installations themselves. It should also be noted that this cost only covers work in the Town's right-of-way. Costs for individual property owners to underground their service laterals are in excess of this cost, and would be the responsibility of the property owner. Property owners are also under no legal obligation to underground their service laterals.

Three other options were considered for lessening the effect of the overhead utility lines along Broad Street. These involved establishing utility easements and then relocating overhead utility lines to the back of the properties along Broad Street, only under grounding the overhead utility lines at the Broad Street and Green Manor Boulevard intersection, and relocating overhead lines so they only exist along the western side of Broad Street.

Establishing utility easements and then relocating overhead utility lines to the back of the properties was brought up at the Public Information Meeting held on January 31, 2005. This method for locating utilities can be effective in new developments where the right-of-way required to accommodate the overhead line can be acquired upfront. This option was investigated based on the

Town's G.I.S. mapping in the area. A study of the area reveals no ideal route for relocating these lines on either side of Broad Street. The west side of Broad Street is complicated by the location of the Saint James Cemetery and Broad Street Parkade. Even if ideal corridors for relocating the overhead lines were available along the backs of the Broad Street properties the costs and difficulties in acquiring easements would be difficult to substantiate. This method would also push the timing of this project out several years. For these reasons this option is not believed to be viable.

The Broad Street and Green Manor Boulevard intersection is a critical location in the success of this streetscape project. Streetscape enhancements proposed at this location will match the enhancements proposed at the Center Street and Middle Turnpike West intersections, which is an important component of tying the entire roadway corridor together. Currently overhead utilities dominate this intersection. Under grounding utilities specifically in this area were investigated, but found to be unfeasible due to the utility company's requirement that a minimum of 1,000 lf of their overhead utility lines be under grounded. Doing only a 1,000 lf portion would be extremely expensive, and appear random along this roadway. Based on field investigation with CL&P it was found that overhead lines could be cleaned up in this area that would result in a significant improvement. A \$250,000 lump sum value was allowed for in the Probable Cost Estimate dedicated to this work.

BL Companies and the Town also briefly investigated with CL&P if utility lines can be relocated to only the western side of Broad Street. In most areas this would be feasible, but costs for pursuing this will likely be higher than the project can support. If funding could be established this would be the most cost effective means for lessening the aesthetic impact of the overhead lines without completely undergrounding them.

General utility impacts, upgrades, and construction concerns related to the implementation of the streetscape and roadway improvements recommended in this report were not coordinated with project area utility companies. This coordination would begin once a Preliminary Design for the project is complete, and the design is coordinated with field survey rather than Town G.I.S. It is anticipated that some relocation of existing water and gas lines may be required for improvements to the roadway drainage system and for the replacement of the Bigelow Brook culvert. An allotment of 4.0% of the total construction cost was included in the probable cost estimate included to cover costs for relocations of underground utilities.

TRAFFIC

Connecticut Department of Transportation (DOT) traffic volume data for state-maintained roadways (in this case Center Street, Route 6/44 and West Center Street, Route 502) and a count taken on Broad Street south of Middle Turnpike provide a sense of the amount of traffic traversing the area. In 2001 the average daily traffic (ADT) at the intersection of Broad and Center was 17,200 vehicles. Center and West Center contributed almost equally to this number with 8,700 and 8,900 vehicles respectively recorded at locations just west of their convergence point in the vicinity of Broad Street.

In 2000 the Connecticut DOT took a 24-hour count on Broad Street commencing at noon on a Wednesday in early November. The recorded data indicate that the traffic volumes on Broad Street relate directly to the retail and convenience uses located there with the 3 highest counts (in

descending order) being noon, 1 PM and 2 PM. This is off-peak from the usual morning peak travel period (6 AM to 9 AM) and standard afternoon peak period (3 PM to 6 PM). High volumes in the PM peak period indicate that homebound commuters divert to Broad Street to shop. Table 4-1 summarizes the traffic recorder data.

In February of 2003 the Traffic Division of the Manchester Engineering Department recorded traffic volumes and turning movements at the Broad Street/Middle Turnpike intersection. These counts were taken at 7:30 – 8:30 AM, noon to 1 PM and 4:30 – 5:30 PM. Again, the counts confirm that traffic is related to land rather than roadway traffic function. In all timeframes the heaviest traffic volumes are on Middle Turnpike West and generally coincide with commuter travel patterns: highest west bound to I-84 in the morning and eastbound to Manchester in the evening. Volumes are almost evenly distributed east/west during the mid-day with increased southbound turns onto Broad Street. Traffic on Broad Street south of Middle Turnpike is heaviest in the noon to 1 PM period but this volume is almost equal to the 4:30-5:30 p.m. period.

This section has been included from the 2003 Parkade/ Broad Street Revitalization Study report.

Table 4-1
Traffic Recorder Data
Broad Street South of Middle Turnpike West

	TIME	WEDNESDAY 11/08/00	THURSDAY 11/09/00
	12A	0	53
	1A	0	21
	2A	0	13
	3A	0	9
	4A	0	27
	5A	0	73
AM PEAK	6A	0	205
	7A	0	522
	8A	0	634
	9A	0	767
	10A	0	804
	11A	0	955
	12P	1035*	0
	1P	1022	0
	2P	995	0
PM PEAK	3P	978	0
	4P	967	0
	5P	866	0
	6P	843	0
	7P	641	0
	8P	429	0
	9P	296	0
	10P	165	0
	11P	115	0
	TOTAL	8352	4083
	24 Hr Total		12,435

*Highest recorded hourly volume

Source: State of Connecticut Department of Transportation, Bureau of Policy and Planning, and Planning Inventory and Data

MAINTENANCE AND PROTECTION OF TRAFFIC

Maintenance and protection of traffic plans should be developed as part of the roadway construction package in order to smooth, uninterrupted traffic flow during construction. Maintenance of traffic plans will be in accordance with CDOT manual titled, "Traffic Control during Construction Operations". Due to the wide width of Broad Street two-way traffic will be able to be accommodated at nearly all times with the possible exception of some work related to the construction of the Bigelow Brook culvert and some drainage lateral work. All driveways shall remain accessible throughout the duration of the project.

RIGHT OF WAY

Based on the Town of Manchester's G.I.S., the existing right-of-way width along Broad Street appears to be typically 58'. Based on the Conceptual Design no partial property acquisitions will be required for this project. Right-of-way issues should be limited to acquiring a few minor sidewalk easements, and to acquiring temporary rights for grading and driveway work on private properties. An additional temporary easement will also likely be required at the Citizen Bank and Tyre Man properties for work related to reconstructing the Bigelow Brook Culvert.

PROBABLE CONSTRUCTION COST

The preliminary design probable cost estimate for this project is based on 2004 weighted unit prices for similar types of construction projects. This estimate includes roadway, utility and other incidental costs to the proposed construction. Right-of-way acquisition costs are excluded from this estimate. Refer to Appendix B for individual quantities, unit prices, and for the specific costs estimated for the proposed work.

Roadway and Infrastructure Improvements: \$2,470,000

Streetscape Improvements: \$1,200,000

Design, Inspections, Construction Administration and Incidentals: \$750,000

Total Construction Cost: \$4,420,000

Under grounding Utilities (entire road): \$6,700,000

Total Project Cost: \$11,120,000

Appendix A

Existing Condition Photographs

*Conceptual Design Report
Broad Street Streetscape
Manchester, CT*



The above picture is looking north on Broad Street towards Middle Turnpike West. The picture shows the existing conditions of the Broad Street with the unsightly overhead utility lines located on both sides of the road.



The above picture is looking south on Broad Street towards Center Street. The picture shows both subbase failures from edge cracking to longitudinal and transverse cracking in the roadway. The picture was taken the intersection of Green Manor Boulevard and Broad Street.

*Conceptual Design Report
Broad Street Streetscape
Manchester, CT*



The above picture is looking north on Broad Street towards Middle Turnpike West; Shaw's plaza is located to the right. It shows roadside ponding and erosion within the roadway limits.



The above picture is looking north on Broad Street towards Middle Turnpike West. The picture shows the gaps in the existing sidewalk network, dangerous pedestrian crossings along property frontages, and worn out paint striped cross walks.

*Conceptual Design Report
Broad Street Streetscape
Manchester, CT*



The above picture shows one of several other buildings that have limited front setbacks and allow full access to their site from the roadway.



The above picture is looking south on Broad Street towards Center Street; Saint James Cemetery is located to the right. It shows the differences in the treatments along both sides of Broad Street. The left side shows a five-foot wide concrete sidewalk with no snow shelf and uses granite curbing. The right side of the road shows a four-foot wide concrete sidewalk with a grass snow shelf and bituminous curbing.

*Conceptual Design Report
Broad Street Streetscape
Manchester, CT*

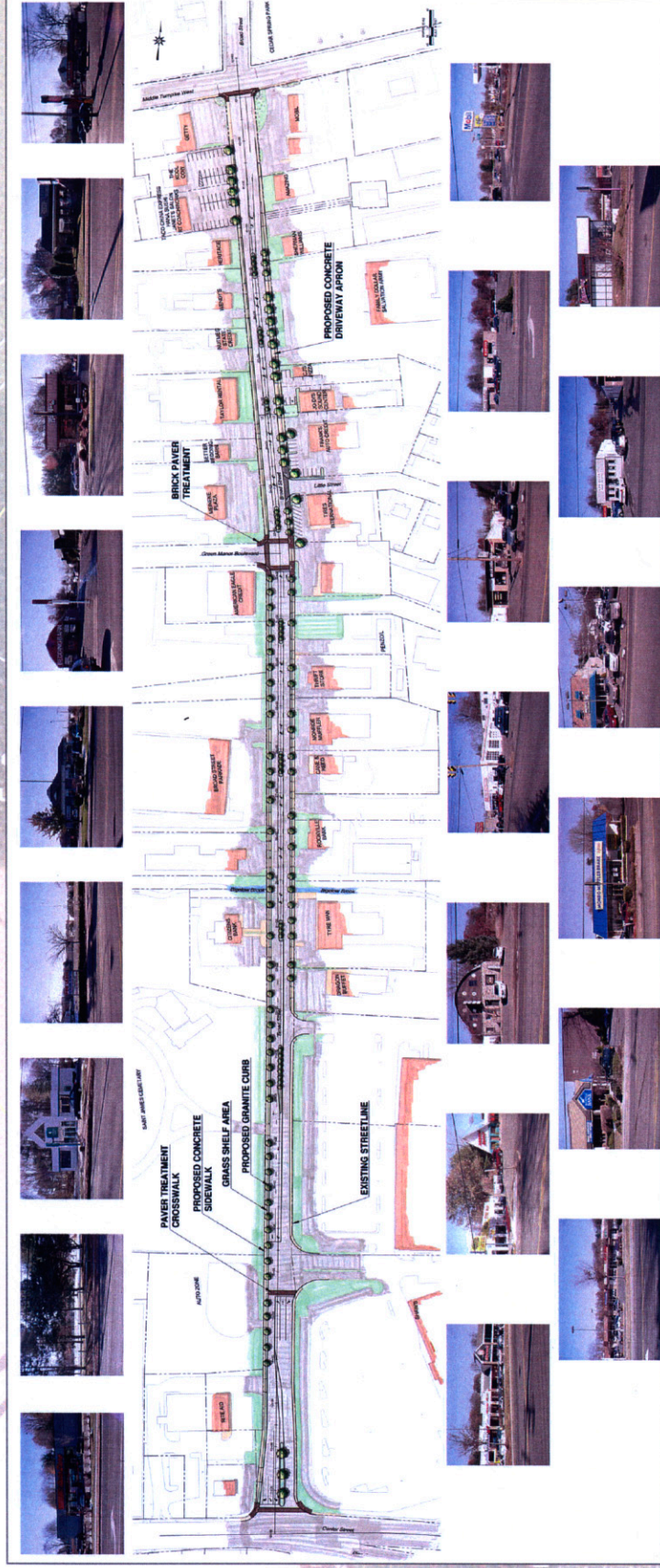


The above picture is looking south on Broad Street towards Center Street. This picture shows another variation of the inconsistency in the treatments along both sides of Broad Street. The left side of the picture shows an area where a building has limited front set back with no sidewalk. The right side of the picture shows bituminous concrete lip curbing with a grass shelf and sidewalk.

Appendix B

Conceptual Design Plan Renderings

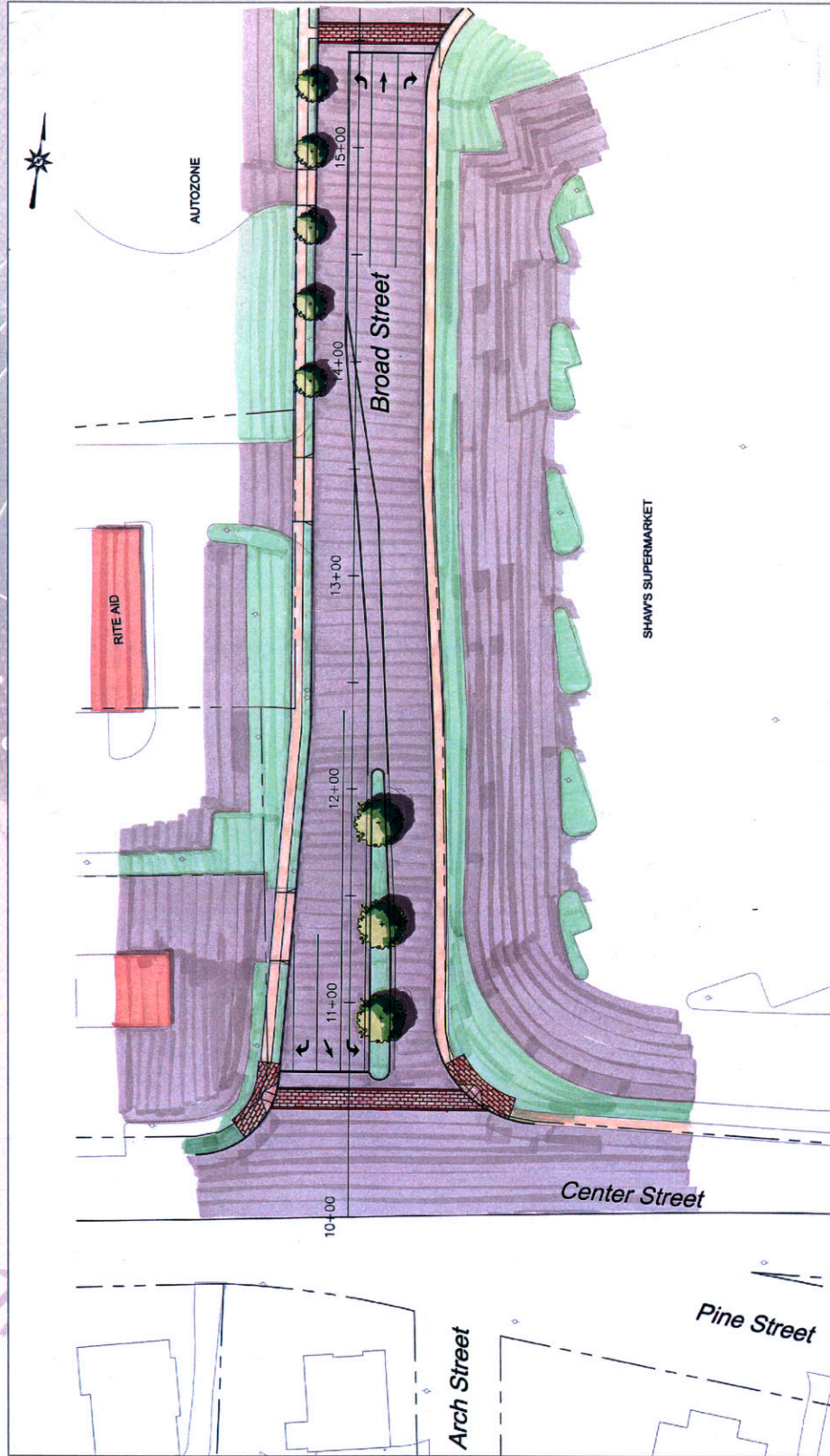
Overall Design Plan



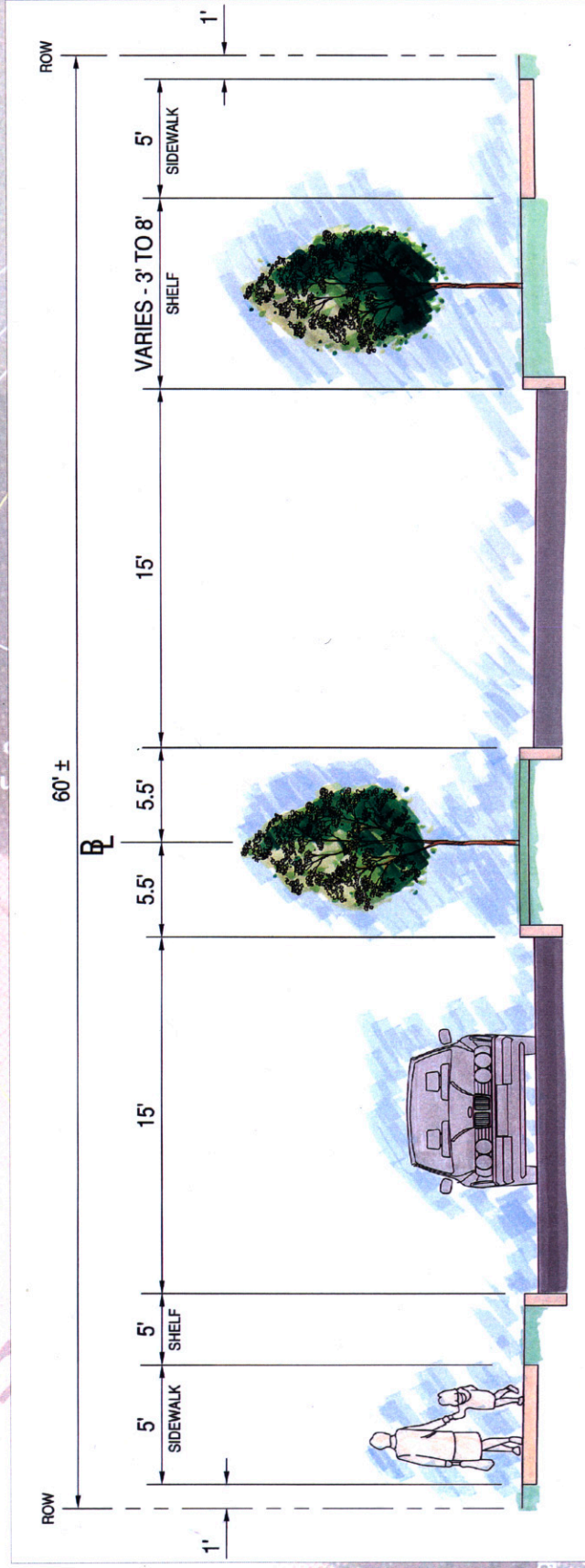
BROAD STREET STREETScape IMPROVEMENT PLAN



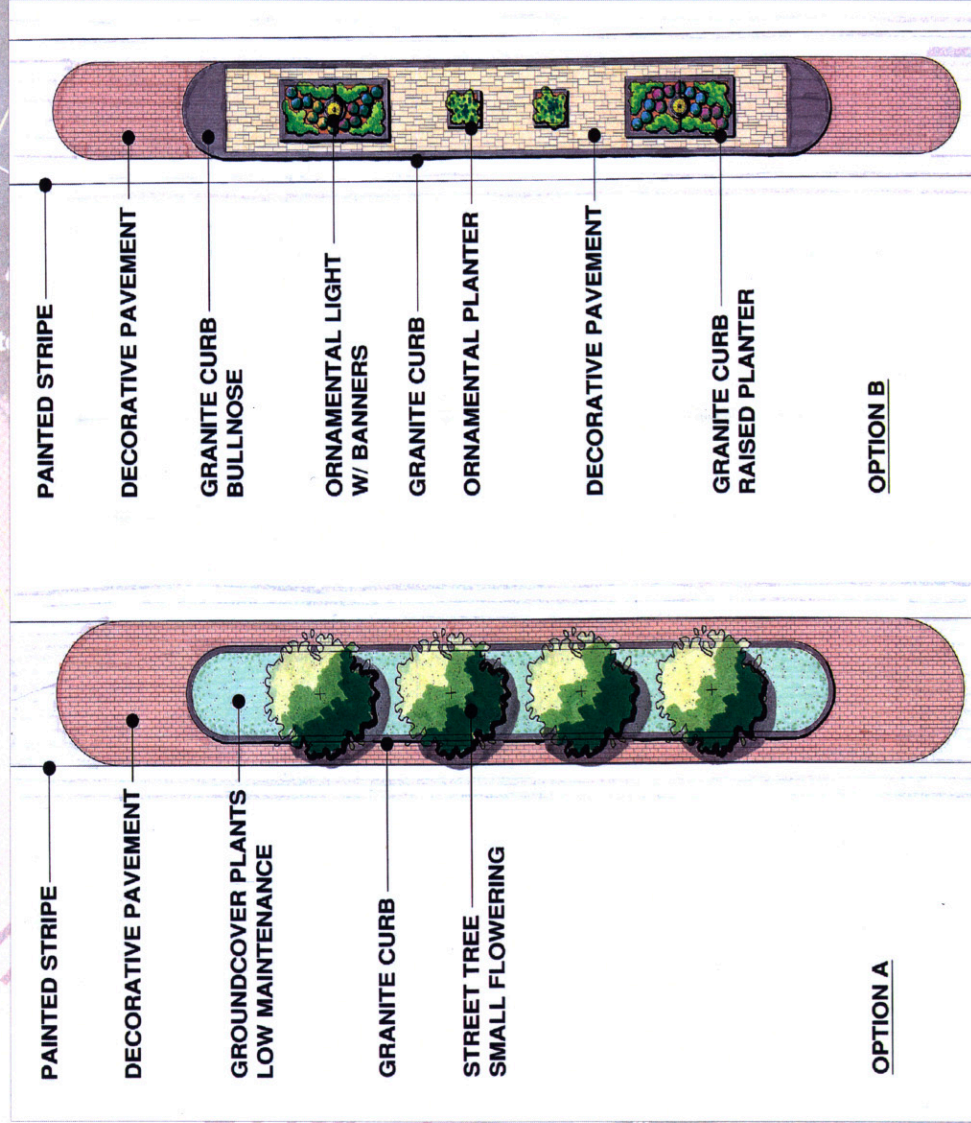
Broad Street Intersection 1



Typical Cross Section



Median Treatments



BROAD STREET STREETSCAPE IMPROVEMENT PLAN

Appendix C

Bigelow Brook Culvert Report

TOWN OF MANCHESTER

EXISTING CONDITIONS AND PRELIMINARY RECOMMENDATION

**BL Project No. 04C0898
Broad Street Streetscape Project**

**Bigelow Brook Culvert
Under
Broad Street**

Manchester, Connecticut

**BL Companies, Inc.
355 Research Parkway
Meriden, Connecticut 06450**

January 25, 2005

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APPENDICIES

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Appendix B: Preliminary Opinion of Construction Cost

Appendix C: Preliminary Recommendation Sketches and Quantities

I. EXISTING CONDITIONS/DESCRIPTION

The existing Bigelow Brook Culvert under Broad Street is located approximately 1500 feet north of the intersection of Broad Street with Center Street in the Town of Manchester. The culvert consists of a single concrete pipe approximately 8 feet in diameter. The endwalls and wingwalls to the culvert are constructed of stone masonry blocks. The existing culvert carries one lane of traffic in each direction with a shared left-turn lane in the center of the road. In addition, a sidewalk exists on both sides of the roadway as it crosses the culvert. The cross section of the roadway across the existing culvert consists of a curb-to-curb width of approximately 36 feet with two 4-foot sidewalks. The out-to-out width is approximately 55 feet. Traffic protection across the culvert consists of a metal beam rail along the east side and a chain link fence along the west side of the culvert crossing. Overhead utility lines are located along both sides of the roadway and culvert. Underground utilities cross above the existing culvert along both sides of the roadway as well.

II. FIELD OBSERVATIONS

Based on our field observations, the existing Bigelow Brook Culvert has several deficiencies and is in a poor condition overall.

The existing bituminous overlay exhibits random longitudinal and transverse cracks with areas of depressions. Inadequate traffic protection exists over the culvert, which is limited to a single metal beam rail on the east side and only a chain link fence on the west side.

Both of the existing endwalls and the wingwalls to the culvert are all in poor condition. The upstream and downstream endwalls to the culvert have structural deficiencies, which consist of several areas of loose and missing masonry blocks with large voids. Settlement caused by these voids is present behind the downstream endwall of the culvert.

Large deposits of debris exist near the upstream end of the culvert. The channel embankments are heavily eroded immediately downstream of the culvert. More notably is the poor condition of the south downstream embankment, which is unstable. Large areas of this embankment have slide down into the bottom of the channel.

In addition, this culvert is located within a regulated FEMA floodway. A pressure flow condition exists at the culvert for both the 50-year and 100-year storm events. Therefore, this culvert is hydraulically inadequate as well.

Also refer to the existing photographs of the culvert included in "Appendix A" of this document.

III. PRELIMINARY RECOMMENDATION

BL Companies recommends the replacement of the existing culvert in its entirety to correct the structural and functional deficiencies, and to improve the overall hydraulic performance of the culvert.

To summarize; BL Companies' preliminary recommendation for this site includes a single span structure, which consists of a 12' x 8' precast reinforced concrete box culvert with reinforced concrete endwalls and wingwalls. A precast concrete box culvert structure is recommended for the site because it is easier to construct than most alternates when multiple stages are required; can be built quicker than most alternates, requires less substructure construction; and minimizes the need and cost associated with future maintenance. We also recommend that the new reinforced concrete wingwalls and endwalls for the new culvert be cast-in-place with concrete form liners and color stained to simulate the aesthetic look of stone masonry.

The existing roadway width and geometry will be maintained across the new culvert. Therefore, the new culvert roadway section will measure about 55 feet out-to-out and carry two 12-foot travel lanes, one 12-foot shared left-turn lane, two 7 ½-foot sidewalks, and two 2-foot curbs. BL Companies also recommends the use of an aluminum open bridge rail on the culvert, which will provide a view of the brook to both pedestrians and vehicles that pass over it. Also, this open bridge rail system will not only offer a safe solution to traffic protection but an aesthetic one as well.

Given the current Average Daily Traffic (ADT) of approximately 12,000 vehicles per day, the recommended maintenance and protection of traffic plan should consist of the culvert being reconstructed in two stages and maintaining a minimum of one lane of traffic in each direction with at least one pedestrian sidewalk during construction. In addition, access to and from businesses along Broad Street will also be maintained during construction.

Furthermore, the replacement of the existing culvert will at a minimum require some reconstruction of each roadway approach to the new structure. Other incidental improvements included are utility relocations and upgrades to the traffic protection along both sides of the roadway and across the new culvert. The extent and requirements of these improvements will be evaluated, closely coordinated with the Town of Manchester, and will be made consistent with the aesthetics used for the Broad Street Streetscape as well.

Also refer to the "Preliminary Opinion of Construction Cost" of the proposed culvert included in "Appendix B" of this document.

Appendix A
Existing Photographs



North Approach Looking South



South Approach Looking North



Looking North over East Sidewalk



Looking North over West Sidewalk



Upstream Elevation / Culvert Inlet



Upstream South Embankment



Downstream Elevation / Culvert Outlet



Downstream South Embankment

Appendix B

Preliminary Opinion of Construction Cost

OPINION OF CONSTRUCTION COST

BL PROJECT NO: 04C0898

PROJECT: BROAD STREET STREETScape - CULVERT REPLACEMENT

TOWN: MANCHESTER, CONNECTICUT

DATE: 01/07/05

DESCRIPTION: CULVERT REPLACEMENT COSTS ONLY

ITEM NO	BRIDGE ITEMS	UNIT	QTY.	UNIT PRICE	TOTAL
0203001	STRUCTURE EXCAVATION EARTH (COMPLETE)	CY	600	\$25.00	\$15,000.00
0213011	GRANULAR FILL	CY	60	\$40.00	\$2,400.00
0216002	PERVIOUS STRUCTURE BACKFILL	CY	1210	\$25.00	\$30,250.00
0406017	BIT. CONC. CLASS 2	TON	14	\$60.00	\$840.00
0601003	CLASS "A" CONCRETE	CY	280	\$450.00	\$126,000.00
0601088 A	CONCRETE FORM LINERS	SF	360	\$20.00	\$7,200.00
0601201	CLASS "F" CONCRETE	CY	28	\$600.00	\$16,800.00
0601139 A	12' X 8' PRECAST CONCRETE BOX CULVERT	LF	55	\$1,000.00	\$55,000.00
0602002	DEFORMED STEEL BARS	LB	28000	\$1.00	\$28,000.00
0602006	DEFORMED STEEL BARS (EPOXY COATED)	LB	5600	\$1.50	\$8,400.00
0904603 A	OPEN BRIDGE RAIL (PEDESTRIAN RAIL)	LF	28	\$300.00	\$8,400.00
0974001	REMOVAL OF EXISTING MASONRY	CY	275	\$130.00	\$35,750.00
				SUBTOTAL:	\$334,040.00
				SAY	\$334,100.00
	COST ESTIMATE SUMMARY				
	TOTAL CONTRACT ITEMS -----				\$334,100.00
	CONTINGENCIES -----	(15	%)	\$50,115.00
	TOTAL ESTIMATED COST (CONSTRUCTION ONLY)-----				\$384,215.00
				SAY	\$384,300.00

Appendix C

Preliminary Recommendation Sketches and Quantities



JOB OKO 898

SHEET NO. 1

OF 4

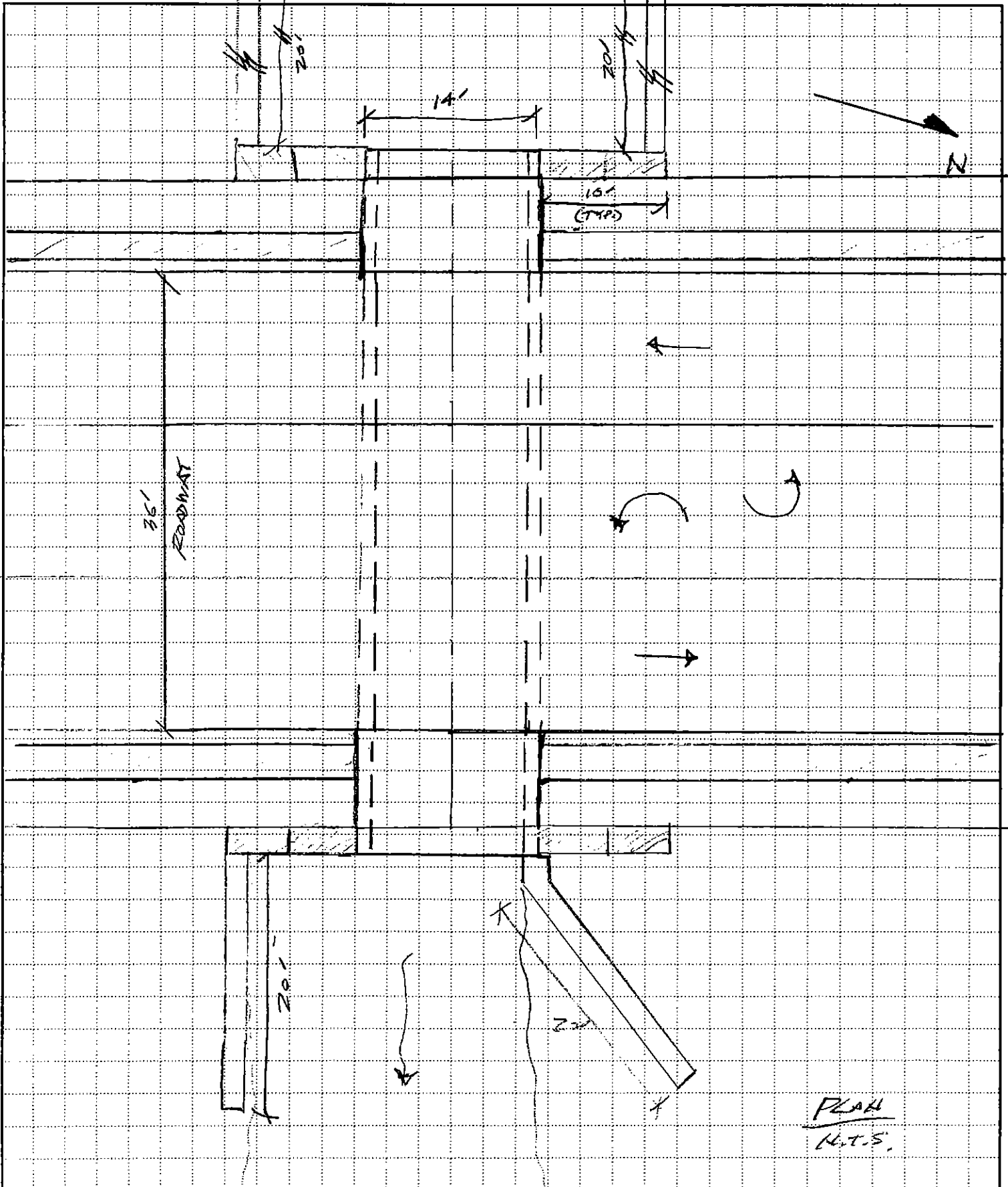
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DATE 1-6-05

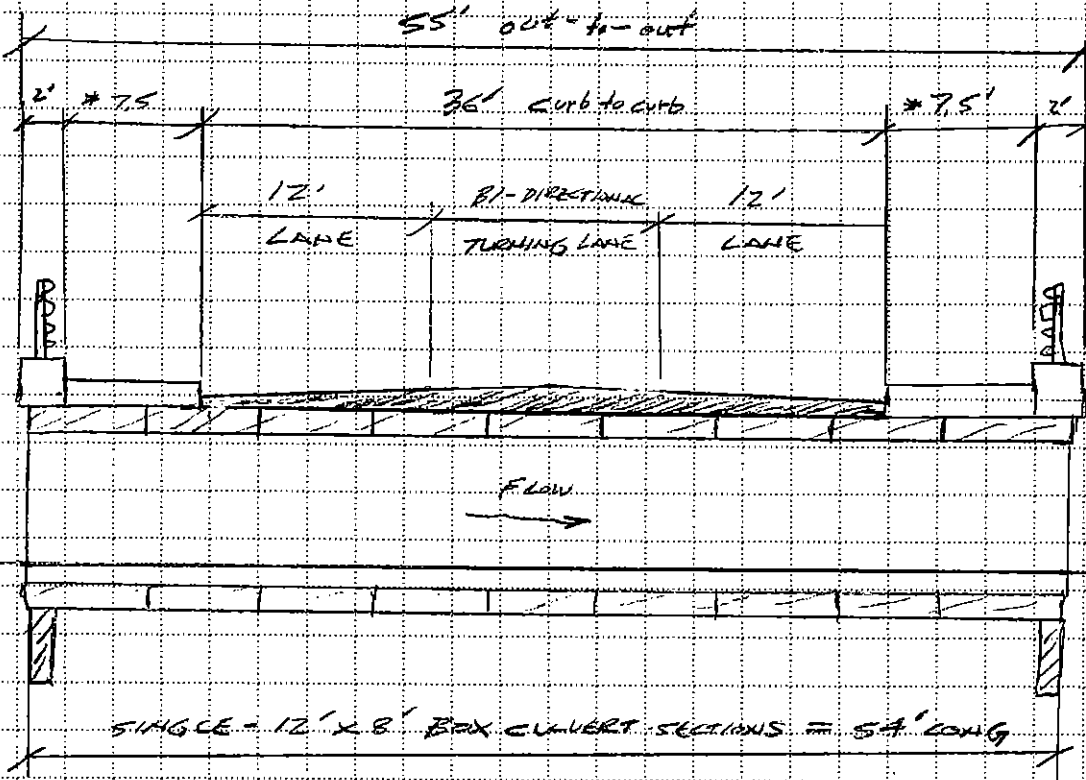
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DATE _____

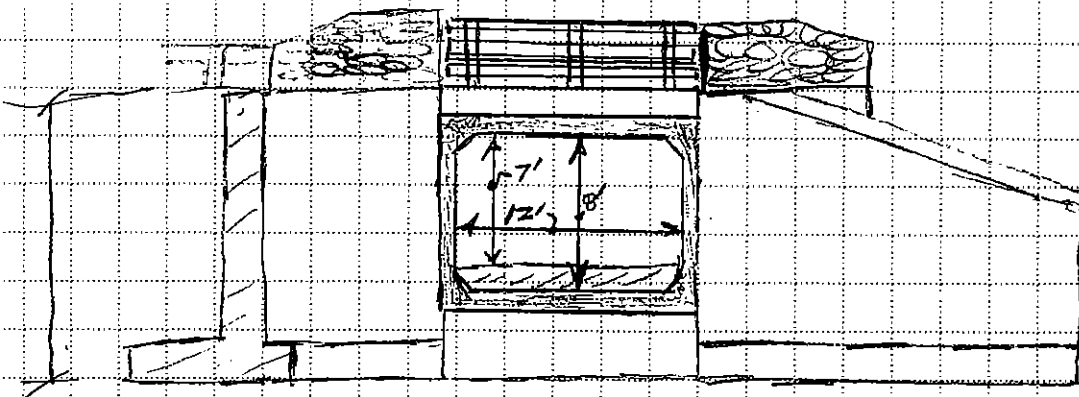
SCALE _____



*(TO MATCH 3.5' GRADE SLOPE & 4' CONC. S.W.)



SECTION
N.T.S.



UPSTREAM
ELEVATION
N.T.S.

QUANTITIES:

① BRIDGE RAIL: $14' \times 2' = \boxed{28.0 \text{ LF}}$

[OPEN BRIDGE RAIL (PED) RAILING]

② CLASS "F" CONCRETE: CURBS $2 \times \left(\frac{2' \times 2' \times 14'}{27} \right) \Rightarrow \underline{4.1 \text{ CY}}$

SW: $2 \times \left(\frac{7.5' \text{ width} \times 1' \text{ thick} \times 14' \text{ long}}{27} \right) \Rightarrow \underline{7.8 \text{ CY}}$

END WALL PARAPETS: $4 \times \left(\frac{10' \text{ L} \times 2.5' \text{ W} \times 4' \text{ H}}{27} \right) \Rightarrow \underline{14.8 \text{ CY}}$

③ BIT. CONC. CLASS 2 OVER BOX:

avg. thickness over boxes = 4"

$\left(\frac{14' \text{ L} \times 36' \text{ W}}{9} \right) (4") (0.0575 \text{ Ton/Sq. In}) \Rightarrow$

TOTAL $\Rightarrow 22.7$

+5% \Rightarrow

$\boxed{28.0 \text{ CY}}$

\Rightarrow

13 TON + 5%

$\boxed{14.1 \text{ TONS}}$

④ 12' x 8' BOXES:

$2 \text{ L} + (2) 7.5' + (2) (2') \Rightarrow \boxed{55 \text{ LF}}$

⑤ CONC. FORM LINER (ENDWALL ONLY):

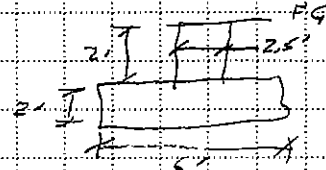
$4 \times \left(4' \text{ H} \times 10' \text{ L} \times 2 \text{ sides} + 2.5' \text{ W} \times 4' \text{ H} \times 1 \text{ end} \right) \Rightarrow \boxed{360 \text{ S.F.}}$

⑥ CLASS "A" CONC.:

CUT-WAY WALLS: $4' \times 1' \times \left(14' \text{ L} + (2) (3' \text{ RECURNS}) \right) \times 2 \Rightarrow \underline{6 \text{ CY}}$

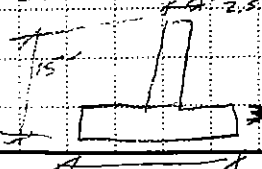
BOTTOM OF ENDWALLS: (1 shallow top)

$\left(\frac{2' \times 2.5' + 2' \times 6'}{27} \right) \times 10' \text{ L} \times 1' \Rightarrow \underline{6.3 \text{ CY}}$



WING WALLS: (ALL, 15' TOTAL HT.)

⑦ WALL UNDER ENDWALLS: $\left(\frac{2.5' \times 12' + 3' \times 11'}{27} \right) \times 10' \text{ long} = 23.3 \text{ CY} \times 3 \Rightarrow \underline{70 \text{ CY}}$



⑧ $\left(\frac{2.5' \times 12' + 3' \times 11'}{27} \right) \times 20' \text{ long} \times 4 \Rightarrow \underline{186.7 \text{ CY}}$

TOTAL $\Rightarrow 267 + 5\% \text{ SW} \Rightarrow \boxed{280 \text{ CY}}$

QUANTITIES

⑦ REMOVAL OF EXISTING MASONRY: $2 \times 50' \times 8' \times 12' \text{ high}$
 $\Rightarrow \frac{27}{137 \text{ CY}}$

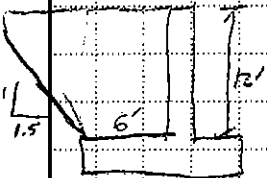
REMOVAL OF PIPE: $8' \times 8' \times 50' \text{ LONG}$
 $\frac{27}{142 \text{ LF}} \Rightarrow 275 \text{ CY TOTAL}$

⑧ STRUCTURAL EXC.

$13' \text{ wide} \times \left(\frac{7' + 15'}{2} \right) \times (20' + 10' + 20' + 60')$
 $\frac{27}{583 \text{ CY}} \Rightarrow 600 \text{ CY}$

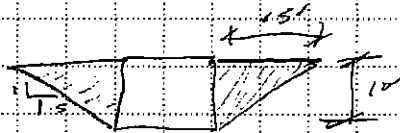
⑨ PREVIOUS STR. BACKFILL:

$(20' + 10' + 20' + 20' + 10' + 20' + 10')$
 $\frac{110' \text{ LONG}}{180 \text{ SF}} \Rightarrow 793 \text{ CY}$



AREA = $(12' \times 6' + (12' \times 15' \times 12')) \div 25' \Rightarrow 180 \text{ SF}$

BOXES: $55' \text{ long} - (2)(6') \Rightarrow 43' \times 2 \text{ sides} = 86 \text{ LF}$



$10' \times 15' = 150 \text{ SF} \times 86 \text{ LF}$
 $\frac{27}{478 \text{ CY}}$

⑨ GRANULAR FILL

WALLS: $13' \text{ WIDE} \times 1' \text{ THICK} \times (110' \text{ LONG (walls)})$
 $\frac{27}{57 \text{ CY}}$

CUT OFF WALLS: $4' \text{ WIDE} \times 20' \text{ LONG} \times 1' \text{ THICK} \Rightarrow 3 \text{ CY}$
 $\frac{27}{3 \text{ CY}}$

END WALL: $8' \text{ W} \times 1' \text{ T} \times 11' \text{ LONG} \Rightarrow 33 \text{ CY}$
 $\frac{27}{33 \text{ CY}}$

TOTAL $\frac{1210 \text{ CY}}{57 \text{ CY}} \Rightarrow 60 \text{ CY}$

Appendix D

Probable Cost Estimates

OPINION OF PROBABLE CONSTRUCTION COST - BROAD STREET

PROJECT: BROAD STREET STREETScape
TOWN OF MANCHESTER
PHASE: PRELIMINARY ENGINEERING
DATE: 12/6/2004

Item No.	Items	Unit	Qty.	Unit Price	Total
ROADWAY ITEMS					
PAVEMENT STRUCTURE REHABILITATION					
0403871	HANDLING COLD RECLAIMED ASPHALT PAVEMENT	SY	18000	\$4.00	\$72,000.00
0403873A	FULL-DEPTH RECLAMATION	SY	18000	\$10.00	\$180,000.00
0406012A	BITUMINOUS CONCRETE - CLASS 1 & CLASS 4	TON	5000	\$60.00	\$300,000.00
TOTAL:					\$552,000.00
STREETScape IMPROVEMENTS					
0202002	EARTH EXCAVATION	CY	3000	\$20.00	\$60,000.00
0202513	REMOVAL OF CONCRETE SIDEWALK	SY	350	\$15.00	\$5,250.00
0202529	CUT BITUMINOUS CONCRETE PAVEMENT	LF	1500	\$1.25	\$1,875.00
0601020A	STAMPED CONCRETE	SF	2720	\$20.00	\$54,400.00
0813021	6" GRANITE STONE CURBING	LF	6500	\$30.00	\$195,000.00
0813031	6" GRANITE CURVED STONE CURBING	LF	250	\$50.00	\$12,500.00
0921001A	CONCRETE SIDEWALK	SF	42000	\$8.00	\$336,000.00
0921008-2A	SPECIAL PAVEMENT - PAVERS ON CONCRETE	SF	2000	\$20.00	\$40,000.00
0921013A	CONCRETE DRIVEWAY APRON	SY	1500	\$100.00	\$150,000.00
0944001	FURNISHING AND PLACING TOPSOIL	SY	10000	\$5.00	\$50,000.00
0950005	TURF ESTABLISHMENT	SY	10000	\$1.00	\$10,000.00
	LANDSCAPING	LS	1	\$100,000.00	\$100,000.00
	ORNAMENTAL STREET LIGHTING (CAPITOL COSTS AND CONDUIT)	EA	30	\$5,500.00	\$165,000.00
TOTAL:					\$1,180,025.00
INCIDENTAL IMPROVEMENTS / COSTS					
0970004	TRAFFICPERSON	EST.	1	\$100,000.00	\$100,000.00
	TRAFFIC (SIGNAL, SIGNING, AND STRIPING)	LS	1	\$100,000.00	\$100,000.00
	DRAINAGE IMPROVEMENTS	LS	1	\$80,000.00	\$80,000.00
	SANITARY SEWER AND WATER MODIFICATIONS	LS	1	\$80,000.00	\$80,000.00
	BIGELOW BROOK CULVERT REPLACEMENT	LS	1	\$450,000.00	\$450,000.00
TOTAL:					\$810,000.00
ROADWAY ITEM SUBTOTAL:					\$2,542,025.00
SAY:					\$2,543,000.00

OPINION OF PROBABLE CONSTRUCTION COST - BROAD STREET

PROJECT: BROAD STREET STREETScape
TOWN OF MANCHESTER
PHASE: PRELIMINARY ENGINEERING
DATE: 12/6/2004

Item No.	Items	Unit	Qty.	Unit Price	Total
CONTRACT ITEMS SUMMARY					
	ROADWAY COST-----				\$2,543,000.00
	MINOR ITEMS-----	(10%)			\$254,300.00
	CLEARING AND GRUBBING-----	(2%)			\$50,860.00
	M & P OF TRAFFIC-----	(6%)			\$152,580.00
	MOBILIZATION-----	(4%)			\$101,720.00
	CONSTRUCTION STAKING-----	(3%)			\$76,290.00
					\$3,178,750.00
	SUBTOTAL CONTRACT ITEMS-----				\$3,178,750.00
	INFLATION FOR 2 YEARS-----	(4%)			\$127,150.00
	TOTAL CONTRACT ITEMS-----				\$3,305,900.00
	CONSTRUCTION TOTAL: SAY,				\$3,306,000.00
	CONSTRUCTION ITEMS-----				\$3,306,000.00
	CONTINGENCIES-----	(6%)			\$198,360.00
	INCIDENTALS TO CONSTRUCTION -----	(10%)			\$330,600.00
	(CONSTRUCTION ADMINISTRATION, TESTING, ETC)				
	UTILITIES-----	(4%)			\$132,240.00
	RIGHT OF WAY-----				\$30,000.00
	SURVEY AND DESIGN	(12%)			\$412,588.80
	TOTAL PROJECT ESTIMATED COST:				\$4,409,788.80
UTILITY IMPROVEMENTS (UNDERGROUNDING)					
	CL&P U/G ELECTRICAL	EST.	1	\$4,400,000.00	\$4,400,000.00
	SBC U/G ELECTRICAL	EST.	1	\$2,000,000.00	\$2,000,000.00
	COX COMMUNICATIONS U/G CABLE	EST.	1	\$250,000.00	\$250,000.00
	TOTAL:				\$6,650,000.00
	TOTAL PROJECT ESTIMATED COST W/ U/G UTILITIES:				\$11,059,788.80